REMARKS

The Office Action mailed July 13, 2004 has been reviewed and carefully considered. The Examiner's reconsideration is respectfully requested in view of the above amendments and the following remarks. Claims 1-40 are pending in the present application. Claims 1, 6, 11-12, 27 and 37 have been amended. Claims 7, 22 and 33 have been cancelled. No new matter has been introduced.

Claim 11 was objected to due to informalities. Applicant has amended claim 11 to correct a typographical error, and has replaced "N/R" with "NIR."

Claim 37 was objected to as having an incorrect preamble; however, the Applicant believes the claim which the Examiner is referring to is claim 34, which has been amended accordingly to read "...method of claim 27..."

Accordingly, withdrawal of both the objections is respectfully requested.

§112 REJECTION

Claims 1-40 were rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention.

Claims 1, 12 and 27 recite "an absorber dye possessing both strong absorption and a high extinction coefficient at a welding wavelength of a radiant energy source." Applicant respectfully submits that the term "strong" used in claims 1, 12 and 27 is described in the specification, e.g., with reference to FIG. 3, which shows a series of transmission graphs wherein curve 40 shows the percent transmission through sample mating material 12 laid on top of a sample workpiece 10. Curve 50 is the percent

transmission through mating material 12 laid on top of workpiece 10 containing absorber dye. As shown by the graph, the absorber dye demonstrates strong absorbance at welding wavelengths e.g., in the visible, near-infrared and infrared spectrums; indeed, the workpieces containing the absorber dye (curve 50) show a marked decrease in transmissivity (and thus strong absorption) compared to the workpieces alone (curve 40) and the welded workpieces (curve 80).

Applicant has utilized the terminology "strong" absorption to describe a consistent characteristic of the dye used according to the present invention at the welding wavelength, which may be in the visible, NIR or IR range. As depicted by, e.g., FIG. 3, and stated in the specification e.g., on page 16, lines 5-6, the degree of absorbance of the dye depends on a number of factors (e.g., the wavelength of light) and thus describing absorption quantitatively was not deemed feasible. In fact, one of the advantages of the present invention is its flexibility in that wide range of dyes and delivery vehicles may be used without negatively affecting its exceptional energy conversion efficiency during radiation.

For the same reasoning as stated above, the terminology "high" extinction coefficient was used. "Extinction coefficient" is defined as the sum of the absorption coefficient and the scattering coefficient; since the absorption coefficient of the dye according to the present invention is strong, it follows that its extinction coefficient will be high.

Accordingly, Applicant believes that the terms "strong" and "high" in claims 1, 12 and 27 are supported by the specification and Figures. Claims 2-11, 13-26 and 28-40 depend either directly or indirectly from claims 1, 12 and 27, respectively and include all

the limitations thereof. As such, withdrawal of the rejection under 35 U.S.C. §112, second paragraph for claims 1-40 is respectfully requested.

§102(b) and §103(a) REJECTIONS

Claims 1-36 and 38-40 were rejected under 35 U.S.C. §102(b) as being anticipated by WO/00/20157 to Jones et al. (hereinafter Jones). Claim 37 was rejected under 35 U.S.C. 103(a) as being unpatentable over Jones. Applicant respectfully disagrees with the rejections.

Jones involves a method for welding workpieces to form a visually transmissive weld by using radiation absorbing material (e.g., dyes) at the joint region which absorbs radiation **outside** the visible spectrum; in fact, Jones specifies that its ideal dye has little if any absorption in the 400-700 nm region (the visible range). *See* Jones, pg. 3, line 15. Indeed, Jones' ability to provide a visually transmissive weld relies on the use of a dye which does NOT absorb wavelengths in the visible range.

In stark contrast, the present invention may utilize either visible light absorbing, near infrared absorbing or infrared absorbing dyes *without* negatively affecting visible or photopic transmission of the resultant weld. In fact, transmission through welded workpieces in the present invention is enhanced and improved over transmission through just the workpieces alone as discussed in FIG. 3.

Moreover, one of the main advantages of the present invention is its flexibility in being able to utilize a wide range of dyes, delivery vehicles and different welding lasers at different power levels. As claimed in claims 1, 12 and 27, the dye may be selected from visible light absorbing dye, near infrared absorbing dye and/or an infrared absorbing

dye. To achieve such flexibility while still enhancing transmission, it is critical that the specified dye density range and thermal energy range guidelines are followed. That is, the claimed density and thermal energy ranges are critical and must be followed to provide the ability of a variety of dyes (including visible-light absorbing dyes) to be used. Jones, however, is not concerned with dye density nor any minimum capacity to convert radiant energy to thermal energy, since it instead simply relies on using a dye which absorbs radiation outside the visible range to achieve a visibly transmissive weld.

Furthermore, it is respectfully asserted that the cited examples in Jones (e.g., page 10, lines 16-34) merely disclose **fabric** welding and fail to disclose or suggest use of the deposition of dye (whether NIR, IR or visible light-absorbing) on a **workpiece,** essentially as claimed in claims 1, 12 and 27. The fabric of Jones is not and cannot be equivalent to a workpiece having a bulk portion, as presently claimed, since dye cannot be deposited simply *on* or *above* a fabric surface; instead, the fabric is a porous surface which absorbs the dye throughout its interstices and therefore necessarily would have dye deposited *below* its surface as well.

Applicant notes the Examiner's citing of Jones as disclosing a concentration of dye of 0.001-0.1 $\mu g/mm^2$; however, this is only disclosed with respect to fabric welding. Furthermore, Jones not only fails to disclose but *cannot* achieve a uniform density of dye deposition, essentially as claimed in claims 1, 12 and 27 of the present invention, because a fabric does not have a uniform surface. Jones does not suggest that the claimed dye density range could be used in combination with a visible dye et al., whereby the invisible by-products of the visble dye are mutually miscible with the surface of the workpiece.

Finally, there is no suggestion that the concentration disclosed in Jones could be used in combination with a visible dye, as claimed in the present invention. Namely, Jones does not disclose or suggest a welding zone having the capacity to convert inbound radiant energy at the welding wavelength over about 0.1 J/mm^2 into thermal energy via vibronic relaxation, essentially as claimed in claims 1 and 27. Such thermal energy conversion capacity is critical in the present invention to achieve decomposition of the dye used to invisible by-products. There is no suggestion in Jones that a power level as low as 0.1 J/mm^2 could be used with a visible dye to produce a weld having a higher optical and photopic transmission than the original ensemble.

Jones' focus is on improving through transmission laser welding and in particular discusses the use of thin film to establish a dye-laden surface to weld plastic workpieces together. The present invention, however, primarily involves pre-processing a workpiece to form a weld-enabled workpiece, which may, e.g., be stored for an extended period of time before being used in a laser welding process.

Applicant acknowledges the Examiner's comments with respect to claim 9; however Applicant respectfully asserts that the depth being sufficiently small to avoid foaming is not inherent. The reason Jones does not teach that welding causes foaming is because Jones fails to disclose any use of a **solvent** with a dye. Please note claim 9 of the present invention refers to wherein the vehicle via which the dye is deposited onto the workpiece is a **liquid solvent** that dissolves the absorber dye.

Regarding claim 10, Applicant respectfully submits that the claimed concentration of dye in the liquid solvent is necessary in the liquid solvent vehicle in order to deliver the surface deposition density of about 5 to about 3000 nanograms of dye per mm^2 as

claimed in claim 1. Accordingly, the concentration of dye in the solvent prior to deposition *does* affect the final product. Furthermore, there is no disclosure in Jones regarding any utilization of a liquid solvent for dye application. *See* Jones, page 4, line 25 to page 5, line 34).

With respect to claim 37, Applicant asserts that reliance on Jones is misplaced since, as mentioned above for claim 10, Jones fails to disclose or suggest using a liquid solvent as a vehicle for dye application. While the Examiner states in paragraph 10 that Jones teaches "that the dye may be applied to the joint region as a coating composition to a final coating weight of 1-100 ng/mm^2," after careful review of Jones, Applicant respectfully disagrees. Jones states that "[T]ypically 0.001-0.1 $\mu g/mm^2$ of dye were applied to the fabric." *See* Jones, page 10, lines 21-22 and lines 33-34. This is to be distinguished, however, from the application of dye onto **polymer workpiece** surfaces, as in the present invention and discussed above. Moreover, there is no teaching of dye concentration parameters in Jones.

Accordingly, claims 1, 12 and 27 are believed to be patentable and nonobvious over Jones for at least the reasons stated above. Claims 7, 22 and 33 have been cancelled. Claims 2-6 and 8-11 depend from and include all the limitations of claim 1. Claims 13-21 and claims 23-26 depend from claim 12 and claims 28-32 and 34-40 depend from claim 27. As such, the dependent claims are believed to be allowable for at least the reasons given above for claims 1, 12 and 27.

Accordingly, withdrawal of the rejections of claims 1-40 under 35 U.S.C. §102(b) and §103(a) is respectfully requested.

CONCLUSION

In view of the foregoing amendments and remarks, it is respectfully submitted that claims 1-6, 8-21, 23-32 and 34-40 are patentable and nonobvious over the cited reference. Consequently, the Applicant respectfully requests reconsideration and withdrawal of the rejections and allowance of the application. Such early and favorable consideration by the Examiner is respectfully urged. Should the Examiner believe that a telephone interview may facilitate resolution of any remaining matters, it is requested that the Examiner contact Applicant's undersigned attorney.

It is believed that no additional fees or charges are currently due. However, in the event that any additional fees or charges are required at this time in connection with the application, they may be charged to Applicant's representative's Deposit Account No. 50-1433.

Respectfully submitted,
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